LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER OF SCIENCE IN

MONETARY AND FINANCIAL ECONOMICS

MASTERS FINAL WORK

DISSERTATION

FUNCTIONAL AND INTERPERSONAL DISTRIBUTION OF INCOME AND ECONOMIC GROWTH IN PORTUGAL

João André Ferreira Alcobia

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Abstract

The objective of this master's thesis is to study the long-term relationship between the interpersonal and functional distribution of income and GDP growth in Portugal for the period between 1985 and 2016.The econometric model chosen is the ARDL-bounds test.There is evidence that the transfer of income from the capital to the labor factor has positive effects on the long term growth of Portugal. The increase in top yields (TOP 0,01%) also have positive but smaller effects.As the reasons given for the increase in the weight of profit share are essentially the same as the increase in top income, it is concluded that governments should be focused on measures to increase wage share and consequently reduce income inequality, having positive long-term economic growth effects.

Keywords :ARDL, bounds-test, Wage Share, Functional Distribution of Income, Top Incomes, Post-Keynesian Economics.
JelCodes :E11, E12, E22, E24, E25.

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Abbreviations

AD – Aggregate Demand
AIC - Akaike Information Criterium
AMECO - Annual Macro-Economic Database of the European Commission's Directorate General for Economic and Financial Affairs
ARDL - Autoregresive Distributed Lag
AWS - Adjusted Wage Share
EC - European Commission
EU - European Union
GDP - Gross Domestic Product
IMF - International Monetary Fund
INE - Instituto Nacional de Estatística
ILO - International Labour Organization
NAIRU - Non acceleration rate of unemployment
NX - Net Exports
OECD - Organisation for Economic Cooperation and Development
PK - Post-Keynesians
PS – Profit share
QP - Quadros de Pessoal
ULC - Unit labour Cost
VAR - Vector Autoregressive
WS – Wage Share

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1 Introduction

Since the mid-1970s, Portugal's average growth rate continued to slow down. At the same time, the functional distribution of income has been unbalanced in favor of capital income and top income has gained preponderance. In order to increase inequality, it was crucial the adoption of pro-capital economic policies. Since 1960, real wage growth has been lower than the growth in labor productivity. The policies prescribed by most economists to contain unit labor costs (ULC) are aimed the reduction of the Wage Share (WS). This tendency of the decrease in the WS was verified in most of the countries of the Organisation for Economic Cooperation and Development (OECD).

So, in the year 2016, the wage share reached its lowest value since 1960. According to Krueger (1999), in the last decades, the increase in the weight of white-collar workers has contributed to the fact that WS has become the wrong way of measuring labor input on a country's level of income. According to Guilera (2008) and Alvaredo (2009), since the mid-1980s, top yields had a generalized increase in Portugal. If we join these facts, we conclude that, if we exclude the weight of top incomes, the reduction of the WS was even stronger (OECD, 2012).

For the most popular models of current macroeconomics, the distribution of income has no impact on economic growth, because it is assumed that markets are fully competitive, and the return of inputs coincides with their marginal productivity. Thus, policies favoring technical progress and structural reforms designed to make prices and wages more flexible will cause an increase in potential growth of the economy and increasing job creation.

By contrast, the Post-Keynesians (PK) do not agree that structural reform, i.e. pro-capital reforms, stimulates the growth of economies because they argue that wages are a source of additional demand for the economy and that marginal costs of firms are constant, which leads to a decrease in average costs until the level of total productive capacity (Lavoie, 2009). The main limiting factor for the investment is the lack of aggregate demand (AD), and this does not depend on saving's level. Investment decisions will influence economic growth and the functional distribution of income.

For PK economists, as the marginal propensity to save in terms of profits, and for higher-income worker is higher, so the transfer of income from the capital factor to labor factor, or from a rich individual to a poor individual, would contribute to an increase in AD.

Following the explanation of PK theories, we will study the long-run relationship between the functional/interpersonal distribution of income and the economic growth rate, using the ARDL-bounds test model. This methodology has the advantage of not requiring that the various variables of the model have the same level of integration. The use of this methodology is unusual for analyzing the relationship between economic growth and inequality, and in the case of Portugal, it is the first time it is being used. The period of analysis of the ARDL model is between 1985 and 2016.

The purpose of my research is to understand the impact of variations in inequality on Portugal's economic growth. If it is concluded that the effect is negative, then the adoption of pro-capital measures will not be reasonable in terms of social justice or from the economic point of view. If it is found that the effect is positive, then even if there is an increase in income inequality, it is assumed that the general population will benefit from increased welfare.

The thesis has the following organization: in section 1, is reviewed the main literature on these topics; in Section 2, will be made a descriptive analysis of the evolution of economic growth and

inequality, and possible determinants of the latter will be discussed ; in section 3, will be examined the economic mechanisms by which the functional and interpersonal distribution of income can affect economic growth; section 4 will be focused on the econometric model, and finally, there will be a discussion of the results.

2 Literature review

There is a vast literature on the impacts of variations in the functional and interpersonal distribution of income on Gross Domestic Product (GDP) growth.

The first models that tried to compare these phenomena were due to Rowthorn (1981), Blecker (1989), and later Bhaduri & Marglin (1990).

According to Rowthorn (1981), an increase in the WS was always expansionary, because it would lead to an increase in AD, ie wage led growth. Bhaduri & Marglin (1990) have pointed out that sometimes the WS increase was not expansionary, and that savings could sometimes have the effect in a profit led scheme.

In general, the models about functional distribution of income are considered exogenous in a single equation model, separating the effects of variations of WS on private consumption, private investment and net exports (NX).

Oliveira (2013), elaborated an empirical study for the Portuguese economy. The findings were similar: an increase of 1 p.p. in the WS, would accelerate GDP growth by about 0,11%. Higher economic growth would occur by the difference between the marginal propensities to consume between wages and profits (0,76 and 0,27), despite the negative effects on private investment and NX. It should be noted that the development of private investment is heavily influenced by GDP growth (very strong accelerating effect). In Stockhammer & Onaran (2016), the conclusions were similar. An increase of 1 p.p in WS causes an acceleration of Portuguese GDP by 0,34%.

Onaran & Obst (2016), developed a study where they analyzed the economic regime of the countries of the European Union (EU) 15 . Most of the economies were in wage led regime. In the case of Portugal, an increase of 1 p.p in Profit Share (PS) will lead to the deceleration of GDP by 0,14 p.p. The transfer of income from the labor factor to the capital factor would contribute to the decrease in consumption and private investment, and an increase in NX. The increase in PS in the EU15 as a whole would have even stronger results.The main conclusion of this study is that a coordination between European States to raise WS would be beneficial for all countries.

The attempt to endogenize the WS variable would make the interpretation of the data more complicated and it would not be possible to measure the quantitative impact of changes in WS on each individual macroeconomic variable. The use of a Vector Autoregressive (VAR) model makes it possible to analyze reciprocal effects between WS variations and economic growth. This system is however limited, since the number of endogenous variables that can be used is reduced. Stockhammer & Onaran (2004) used this technique to analyze the Turkish and South Korean economies.

The various studies point out that the main economies are in a wage led regime.

Economists say that economies should not promote the increase in WS because it will contribute to the increase in ULC. However, sometimes, this is not necessarily negative. According to Kaldor (1978), in the post-World War II period, the countries with the highest growth rates of the ULC were also those with higher GDP growth (Kaldor's paradox).

By contrast, there are empirical studies indicating that wage increases have positive effects on labor productivity developments [1].The Kaldor-Verdoon condition also occurs in the most different

[1]Vergeer & Kleinknecht (2010) studied this relationship for 19 OECD countries (1984-2004) and concluded that increasing real wages by 1pp leads to increases in labor productivity between 0.31-0.39p.p.

economies[2].

According to the International Labour Organization (ILO) (2010), the reduction of WS, contributed to a reduced level of AD, which led to accumulation of external imbalances between countries. The increase in income inequalities would cause the onset of the 2008 Financial Crisis because it contributed to the economic agents' indebtedness and the widening of macroeconomic imbalances (Ranciere et al, 2012 ; Kumhof et al, 2013; Treeck, 2014).

For Palley (2011), economic growth through increased debt (Eg-United States of America, Spain, Italy, Greece, etc.) or through export promotion (eg - Germany, Japan, China) are interdependent (exporting countries provided financing to countries with credit booms , but the latter consumed the goods produced by the former). In the long term these growth strategies are unsustainable due to the excess of the indebtedness of the first groups of countries and due to the increase in the relative weight of the second group of countries.Thus, Palley concludes that systems are "depleted" and therefore should increase economic cooperation between countries to try to increase the WS, especially by exporting countries.

Carvalho & Rezai (2015) studied the difference between the marginal propensity to consume for workers with different levels of income and concluded that the marginal propensity to consume decreases as the level of income increases[3].In the same study, they demonstrated that the reduction of interpersonal inequalities contributed to the economic regime to become more wage -led[4].

Palley (2013a) developed an innovative model, where he tries to divide the economic agents into capitalists, workers and managers. This distinction happens to analyze, on the one hand, the economic impact of the increase of WS (transfer of income from capitalists to both managers and workers) and, on the other hand, the economic impact of wage transfers from workers to managers. This study was an innovation because it assumes that an economy can be in different regimes (profit or wage led) depending on whether we are analyzing the functional or interpersonal distribution of income [5].

The conclusion of this section is that several research studies have already addressed the relationship between the interpersonal/functional distribution of income and economic growth. However, this research is one of the first to create a system with interpersonal and functional income distribution at the same time. As a rule, inequality tends to penalize economic growth.

3 Descriptive Analysis

In this chapter will be analyzed the interpersonal income inequality and the WS in Portugal. It will also address some determinants of interpersonal inequality and WS.

The Portuguese economic growth has experienced different phases since the early 1960s, homewer the tendency has been the decrease in the rate of economic growth - see figure 1.

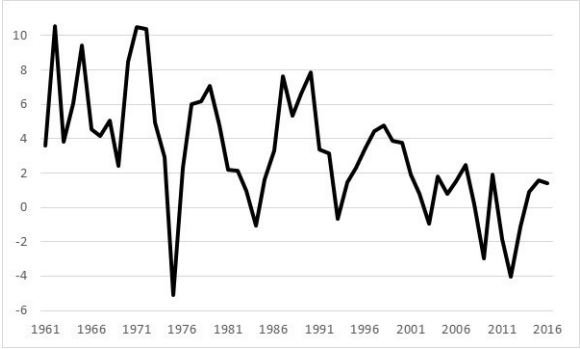
[2]According to McCombie et al (2002), in the OECD countries, GDP growth by 1pp is associated with productivity growth of 0.46p.p.

[3]Carroll (1998) and Palley (2010), carried out an empirical analysis and reached the same conclusions.

[4]In an economy with a low level of interpersonal inequality, the differential between the marginal propensities to consume between wages and profits is higher than in a country with a high level of interpersonal inequality.

[5]It is important to study the simultaneous effects because from the 1980s to the great recession the WS was a slight decrease, but the increase in interpersonal inequalities was very strong.

Figure 1: Economic Growth in Portugal (1960-2016)



Source = AMECO

3.1 Evolution of Functional Distribution of Income

The functional distribution of income relates to how the income is distributed by the different factors of production. A major remuneration of the labor factor is wages (Wn)[6]. Thus, capital is remunerated by what is designated as the gross operating surplus, ie,dividends, interest and profits (πn).

When we calculate GDP at factor prices, we exclude Indirect Tax Net of Subsidies (ITS).

$$\text{GDPMarketPrices} = Wn + \pi n + ITS \tag{1}$$

Thus, the formula is:

$$GDP = PGDP_n = Wn + \pi n = wnL + rnK \tag{2}$$

The real product (GDP) is calculated by dividing the nominal product (GDP_n) by the price index (P). The total wage (Wn) can be calculated by multiplying the nominal average wage (wn) by the employment (L).Total profits (πn) are calculated by multiplying the nominal profit rate (rn) by the level of the capital stock (K).

The functional distribution of income was very important to classical economists. For Ricardo (1911), finding out which fundamental laws determined this form of income distribution is one of the main problems of political economy.

In 1957, the economist Nicholas Kaldor indicated a set of facts that would become controversial. One of the most important facts was that WS, ie the proportion of income distributed in the form of labour compensation, was constant over time (Kaldor, 1957). When this premise was indicated, most economies grew at a strong pace, unemployment was residual and people reap the fruits of economic growth through better wages and more social benefits, and therefore, it did not attract much interest.

[6]Other examples of remuneration in the labor sector are performance bonuses, regular bonuses and remuneration for supplementary work.

However, in the mid-2000s, a set of studies indicated that the WS had been steadily declining since the 1970s, and this phenomenon was happening on a global scale (Karabarbounis & Neiman , 2013).

For Atkinson (2009), it was important to study the functional distribution of income because it would help to explain interpersonal inequality, to discuss the fairness of different forms of income, and because it is useful for understanding the link between incomes at the macroeconomic level (national accounts) and incomes at the individual or household level.

The ILO has identified that the average WS has fallen by about 10 p.p from the 1970s to the pre-crisis period (Stockhammer, 2013). At the same time, according to Daudey & Garcia-Penalosa (2007), the decrease in WS has had repercussions in increasing interpersonal inequality, because as the capital income is more unequal, an increase in this share will penalize the distribution of interpersonal income.

There has been a large increase in income inequality, especially with regard to the top incomes [7] And at the same time, workers with a median and low income saw their wages stagnate. The proportion of workers considered to be underpaid [8] , increased by two-thirds in the 37 countries surveyed since the mid-1990s (ILO, 2010).

In the post-crisis period, WS continued its downward trend, especially in the European countries most affected by the crisis of 2008 (ILO, 2016) - see table 10 in the Appendix.

The institutions FRED and OECD produce estimates of WS. Two series regarding data, WS at market prices and factor prices (minus taxes on production and imports, plus subsidies) have been published. According to Guerriero (2012), it makes more sense to use GDP at factor prices because taxes are not considered return on capital and therefore should be subtracted, since subsidies are retained and must be added.

The following formula determines an economy's WS

$$WageShare = \frac{NominalWageRate}{PriceLevel} \times \frac{TotalEmployment}{ValueAdded} = \frac{NominalWageRate}{PriceLevel} \times \left(\frac{1}{\frac{ValueAdded}{TotalEmployment}} \right) \quad (3)$$

Deriving the previous formula, it becomes a relation between real wages and labor productivity, that is, Real ULC. Thus, for the value of WS as a percentage of GDP to remain constant, it is necessary that real wages increase at the level of labor productivity, assuming other constant assumptions.

The economic policies of the European Commission (EC) aimed at containing ULC ultimately lead to a reduction of WS (Felipe, 2011).

According to Naastepad & Storm (2006), growth in labor productivity and real wages was high in the OECD countries during the period 1960-1980[9]. Meanwhile, in the period 1980-2000, labor productivity grew on average 1.8% and real wages were virtually stagnant. Thus, in this way, the WS tended to decrease in developed countries.

In addition, the WS is calculated in an adjusted or unadjusted manner. The main difference between the two methods is that the Adjusted Wage Share (AWS) included the weight of self-employment.

[7] In 2007 the top 1% in the United States of America, held 23.5% of total income (the highest level since the Great Depression).

[8] Defined as the proportion of workers whose hourly wages were less than two-thirds of the median wage across all jobs.

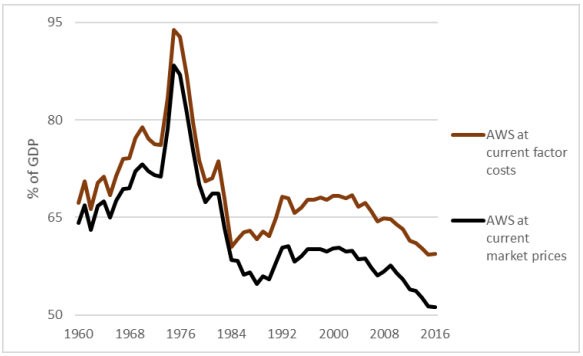
[9] About 4,7% and 5,5% respectively.

However, as in most developed countries the weight of self-employment is residual, there are not many differences in the trend of the two indicators (ILO, 2010; Guerriero, 2012).

$$AWS = \frac{Compensation.Employees}{GDP.factor.costs} \times \frac{TotalEmployment}{TotalEmployees} \quad (4)$$

This way of calculating WS has the problem of assuming that the compensation of employees is the same for employment and self-employment.

Figure 2: AWS in Portugal (1960-2016)



Source = AMECO

In Portugal, the evolution of the AWS was, in general, similar to that of other developed countries. The evolution of AWS since 1960 until 1976 has been positive due to two main factors (Mamede et al., 2013):

- the rapid industrialization that followed Portugal's entry into European Free Trade Association;
- the colonial war (1961-1974)[10].

During the revolutionary period (1974-1976), wages grew at a higher rate than labor productivity, as a result of social pressure to improve living conditions[11], and this caused a positive evolution in AWS, which has reached its maximum of the series in 1975. From 1976 to 1988, the AWS trend was negative, and this was the result of international economic crises and the measures of the two adjustment programs carried out by the IMF (Mamede et al. 2013). In these periods, the wage increase was lower than the growth of productivity. On the contrary from 1988 to 1993, the evolution of the AWS was positive due to economic growth. From the mid-1990s until the international crisis of 2008, AWS was relatively stable , and only began to decline in 2010. Since 2010, it has resumed this negative trend and reached its lowest value in 2016.

For the reduction in the AWS, the rise in unemployment was relevant. Another factor that explains the evolution of this indicator was the austerity measures that led to a reduction of wages.

Despite the reduction in AWS, some economists point out that one of the reasons for the stagnation of the Portuguese economy since the year 2000, was the wage growth above compared to the growth of

[10] Mass emigration along with the mobilization for war has led to a shortage of labor, leading to higher wages.
[11] Was with the 25 of April that was instituted the minimum salary, unemployment subsidy and a social status of European level.

productivity (Blanchard, 2006). Nevertheless, from 1960 to 2015, wage growth was much lower than the growth in labor productivity- see figure 11 in appendix. According to the Gabinete de Estudos Económicos – Ministério Economia e Inovação of Portugal (Pordata, 2018), the average salary for employees in the private sector in Portugal in 2015 was around 913.9 €. If wages and productivity had grown at the same level between 1960 and 2015, the average salary would be around 1271.43€ in 2015.

After 2010, because of economic crisis, the gap between the evolution of labour productivity and real wages increased.

3.2 Interpersonal Distribution of income

In the previous chapter, we analysed the declining in WS after mid-1970s. In Portugal, due to the existence of exogenous shocks, we found that the reduction in WS was higher.

According to Krueger (1999), the WS is a wrong way of measuring the labor factor input on a country's level of income, because includes wages of individuals with high income.

So, if we exclude the weight of top incomes, the reduction of the WS was even stronger (OECD, 2012).

For this reason, it makes sense to also analyze the interpersonal distribution of income in Portugal over the last decades.

In developed countries, the level of dispersion of incomes has increased sharply, to highlight the increase in the weight of top incomes (Piketty & Saez, 2003; Forster & Llenanozal , 2011; Atkinson et al., 2011).

According to Piketty in his controversial book, Capital of the 21st Century (Pikkety, 2014), the countries with the largest PS are also those where interpersonal inequalities are most pronounced.

Evolution of Main Indicators

To analyze the interpersonal income inequality I will address the evolution of the GINI coefficient, S80/S20, S90/S10 , and top incomes in Portugal.

The GINI coefficient is a synthetic indicator of inequality and assumes values between 0, in a situation in which all individuals have the same income and 100, in which an individual has all the income in a given country.

The S80/S20 indicator indicates the proportion of the total monetary income received by the 20% of the population's higher incomes in relation to the total received by the poorest 20%. The same can be assumed for other analysis quantiles (Eg-S90/S10). Meanwhile, the P90/P10 indicator gives the ratio between the income earned by the pair of individuals in the 10th and 90th percentiles. It will be in analysis other forms (eg P95/P5).

For the indicators for which data is available for the whole economy, I will use the data processed by Eurostat and the Instituto Nacional de Estatística (INE), starting the series in 1993. I will also address, when necessary, data Quadros de Pessoal (QP) - worked by Rodrigues et al (2012). This data covers the period between 1985 and 2009, and the focus of study is the salaries of employees in the

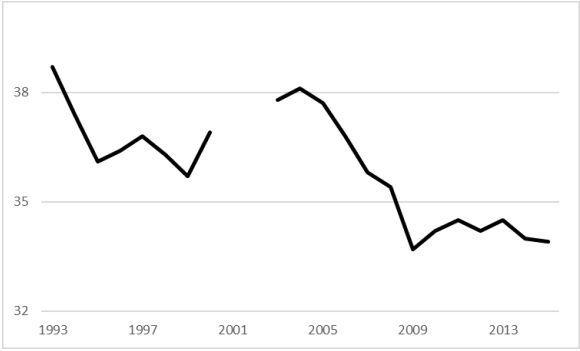
private sector.

The reason for collecting these different indicators is to be able to study various types of income asymmetries. Thus, the gini index, for example, is particularly sensitive to the variation of yields in the central part of the distribution. Other indicators, such as the S80 / S20, are sensitive to the variation in the extreme yields of the distribution, with no impact on what happens in the central part of the distribution.

Regarding the data from Eurostat/INE, the Gini index in 1993 reached 38.7, and from then on it has verified a general improvement up to the year 2000. Despite a deterioration of this indicator from 2000 to 2004, the trend from 2005 onwards continues to be a reduction of inequalities in Portugal. In fact, the index reached, in 2009 the minimum of the series with 33.7. From the beginning of the most severe economic crisis in Portugal, the GINI index no longer has its downward trend and stabilizes around 34. Despite the stabilization of the GINI index, the inequality of market income deteriorated in the period in question (Rodrigues et al., 2016) [12].

In the data from QP, there was a large increase in the Gini index, from 28.4 in 1985 to 34.4 in 2009. There was only a decrease in inequality between 1996 and 1999 and in the period after 2005 - see figure 12 in appendix.

Figure 3: Gini index per equivalent adult in Portugal

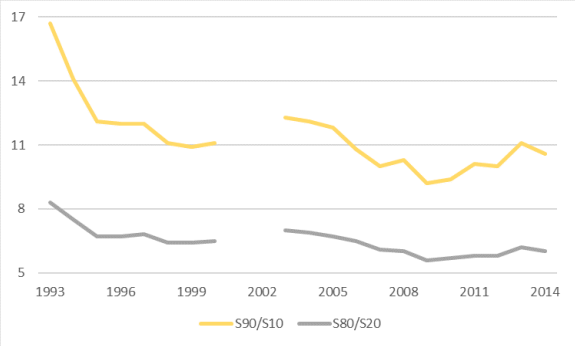


source : INE until 2000 after Eurostat

For S80/S20 and S90/S10, for INE/EUROSTAT data in Portugal, these indicators improved. Thus, indicators S90/S10 and S80/S20 had their maximum value in 1993, with 16.9 and 8.2, respectively. Subsequently, these indicators of inequality improved, until 2000. In spite of a small increase in inequality in Portugal in the years 2000 and 2003, from 2004 onwards, these indicators started to decline again and reached the minimum limits of the series in 2009, with S80/S20 reaching 5.6 and S90/S10 to reach 9.2. Thus, from 1993 to 2009, the income gap between the poorest 20% and the richest 20% had a large reduction (the same situation occurred in the income gap between the poorest 10% and the richest 10%).

[12] There was not a major worsening of this indicator, because the state redistribution more than counterbalanced the effect of the greater inequality of market incomes.

Figure 4: Income inequality per adult equivalent in Portugal - S80 / S20 and S90 / S10



source : INE until 2000 after Eurostat

From 2009 to 2014, when the crisis worsened, there was a reversal of the improvement in indicators of inequality, with the increase of S80/S20 and S90/S10.

In the case of QP data, for indicators S80/S20 and S90/S10, inequality in Portugal followed a growth trend from 1985 to 2009 (despite some years with improvements of little relevance) - see figure 13 in appendix.

Thus, in the years of the crisis, income inequality at the center of distribution remained stable, but there was an increase in inequality at the extremes of income distribution. According to Rodrigues, this increase in extreme inequalities is due to the lower income of the poorest individuals[13] .

Despite the improvement in the indicators of inequality since the 1990s, Portugal is still one of the European countries with the highest level of income inequality, only being better positioned than the generality Eastern European countries (Farinha et al, 2012).

Regarding the top incomes, Alvaredo did an exhaustive research based on data from the tax administration (Alvaredo, 2009), and analyzed the evolution of higher incomes from a historical perspective (1936 to 2005). Some of the indicators have only been available since 1976, while most of them have been available since 1936.

In the same period, Guilera (2008) also analyzed the concentration of income and wealth in Portugal, using data from the tax authorities[14].

Although the data does not have as much variability, the conclusions of the studies are similar. The weight of top income in Portugal was very high during the dictatorship regime. From the 1960s until the early 1980s, there was a decrease in the weight of these incomes. After 1980, the weight of the top yield increased until 2005, however, the TOP 0.1% and TOP 0.01% continue to present a much lower weight than happened until the 1960s.

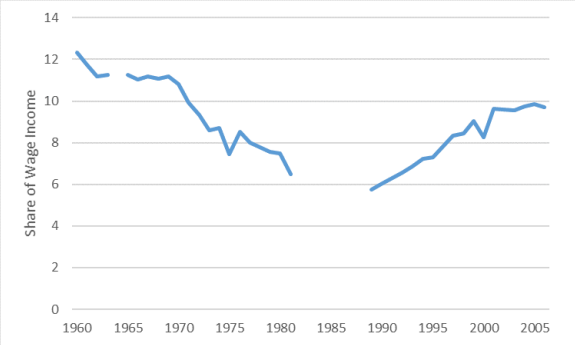
The upward trend of top income has taken place globally (Forster & Llenanozal, 2011), but Portugal was in 2005, one of the OECD countries with the highest share of these incomes - see figure 14 in the

[13] Between 2009-2014 the real performance of the equivalent real income of the 1st decile was -25%, while in the 10th decile this variation was -13%. In the period between 2006 and 2009, the real evolution had been 11% in the 1st decile and -6% in the 10th decile.

[14] The differences between the two estimates concern the different treatment of the original data, the different method for adding social contributions to taxable income and different understandings for income.

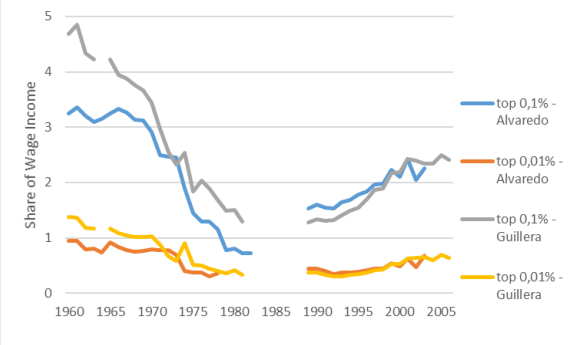
appendix. According to data from Cantante (2013), in 2005 the average gross annual income of an agent that belongs to the richest 1% in Portugal was 142.703 €, while in the case of the richest 0.1% it was 361.763 €. Lately, in the case of the richest 0.01% it was 1.012.527 €.

Figure 5: Top income in Portugal - 1%



source : data Guilera

Figure 6: Top income in Portugal - 0.1% and 0.01%

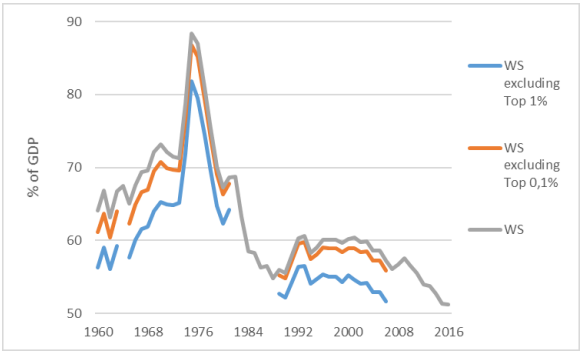


source : data Guilera & Alvaredo

Following the OECD (2012) idea, I will analyze the evolution of WS in Portugal, excluding the weight of top income.

As can be seen in the following graph, excluding the top yields, the decrease in WS was even more.

Figure 7: AWS excluding top yields



source = Data Guilera; AMECO; Data developed by my own.

The main conclusions of this chapter are that although the functional distribution of income has become more unequal, especially in the periods after 1976 and 2010,[15]. There has been an improvement in the generality of indicators of interpersonal inequality, both at the center and at the extremes of the distribution. In the period after the crisis of 2008, there was a deterioration of the indicators of inequality. Guilera (2008) and Alvaredo (2009) concluded that there has been an increase in the importance of top income in Portugal since 1980.

If we analyse the data from QP, we will see that the importance of the weight of top yields actually increased (especially in the TROIKA period) - see figure 15 in appendix.

3.3 Determinants of Functional and Personal Distribution of Income

As previously mentioned, both in Portugal and in most western countries, the distribution of functional and interpersonal income has become more unequal since the mid-1970s. Thus, it is important to study the main explanatory factors for the evolution of these indicators. It makes no sense to separate the determining factors, because the causes are in part the same.

According to E. Stockhammer (2013), there are 4 main reasons for the negative evolution of the WS in most western countries:

1. technological evolution (measured by the working capital ratio and the weight of ICT services);
2. globalization (measured by the openness of the economy);
3. financialization (measured by external assets plus external liabilities in percentage of GDP);
4. reduction of the welfare state (measured by the public expenditure as % of GDP and conditioned by the unionization rate).

Technological development influences the functional distribution of income, because the ICT revolution has led to low-skilled workers being replaced by machines, and more skilled workers complement those machines. Thus the demand for more skilled workers increases, and the opposite happens for the less

[15] Even stronger if we exclude WS from top income.

qualified workers. These two joint effects contribute to the increase in wage dispersion (due to the increase in premium skill). The increase in the dispersion of wages, lead to the decrease of the WS, because the increase in the weight of the most skilled workers is not enough to compensate the decrease in the weight of the less skilled workers.

According to Palley (2013b), globalization is the set of policies that lead to free trade, increased mobility of capital and business on a global scale. It is understood as the type of economic policy advocated with the Washington consensus.With globalization, national workers feel increased competition at international level. This factor culminates in the diminuition of their bargaining power. According to Rodrik (1997), as capital is the most mobile factor, it benefits from the liberalization that occurs.

The bargaining power of trade unions has also been reduced by globalization. According to the ILO (2010), workers feel the threat of factory outsorcing to countries with lower labor costs.

According to Onaran et al. (2011), financialization is understood as the deregulation of the financial sector, the proliferation of new financial instruments, the increase of private debt and a great increase in the income of workers' agents in the financial sector.

As profit maximization in the short term is vital, firms should limit spending to the minimum, particulary labour costs (Stockhammer, 2010).

According to Palley (2013b), finance has been marked by the transfer of income from labor to capital, the change in the composition of payments to the capital factor and the increase in the weight of the financial sector in the totality of profits generated.

According to the authors, the decrease in the welfare state is considered an explanatory factor for the decrease in WS because it contributes to the reduction of workers' bargaining power[16]. According to Dünhaupt (2013), the privatization of state-owned enterprises also contributed to the reduction of the AWS, because on average the profit of these companies is lower than in the case of private companies.

There is no consensus among economists on which was the most responsible factor for the reduction of the weight of wages in income. For Stockhammer (2013), in the case of developed countries, the financialization of the economy was the most influential factor in the evolution of the WS. Meanwhile, the IMF (2007) and the EC (2007) indicate that it has been affected by technological developments, and globalization has also been relevant.

There are explanatory studies on the functional distribution of income in Portugal (Barradas & Lagoa, 2015). These economists give special emphasis to the role of financialization in WS, and additionally analyze other factors, such as globalization, technology, education and business cycle.

According to the authors, financialization influences the functional distribution of income in three ways:

1. it leads to a change in the sectoral profile of the economy (increase in the weight of the financial sector and decrease in the weight of the public sector);

2. it facilitated the emergence of shareholder value orientarion theory[17];

3. it contributes to the weakening of trade unions- see figure 16 in appendix.

[16]For the IMF & EC (2007), the factors that influence workers' bargaining power are the unionization rate, labor market legislation, tax wedge, and generosity of the unemployment benefit.

[17]Further explanation in Stockhammer (2005).

The main conclusions of this study, in the short term, are that, the increase in financialization of the Portuguese Economy led to a decrease in WS. On the contrary, the increase of the weight of the state in the economy, and the increase of the unionization had a positive effect in WS.

In the case of interpersonal income distribution, the determining factors are similar. In order to analyze the determinants of the evolution of the weight of the top 1%, top 10% -1%, and the rest of the population, Jester Roine et al. (2009) used a panel of data. They define that the share of different levels of income can vary due to changes in economic growth, level of financial development, degree of openness of the economy, level of public expenditure as a percentage of GDP and level of taxation.

In the phases of economic expansion, there is an increase in the relative weight of the TOP 1%. This is because profits are, as a rule, pro-cyclical, ie, they increase more than the GDP growth. The level of financial development, translated by the relative weight of the banking sector and the stock market, also has a positive impact on the weight of higher incomes. (the occurrence of bank crises eventually leads to losses in these agents). Public expenditure in percentage of GDP has no impact on the weight of the top 1% and influences positively, the evolution of the lower incomes. The increase in taxation, as measured by the increase in maximum marginal tax rates, contributes to the reduction of the top 1% and top 1% -10%.

According to Piketty & Saez (2011), the high increase in marginal maximum tax rates was one of the most important factors to the reduction of income after World War II in developed countries (in Portugal it was similar).

For Jester Roine et al. (2009), openness to trade has no impact on income inequalities. There are also other explanatory factors for income inequality. For the IMF (Dabla-Norris et al, 2015 ; Jaumotte et al, 2013) technological developments, changes in institutions in the labor market, globalization and financialization were also important. Labor market reforms have contributed to wage stagnation and increasing wage inequalities, as they lead to a reduction in the rate of unionization, labor market solidarity[18], and stagnation of the minimum wage.

4 Demand effects due to the variation of the WS

For the most popular models of the comtemporany macroeconomics, the distribution of income has no effect on economic growth, and markets are considered to be perfectly competitive. It is argued that the return of labor and capital must be equal to its marginal productivity.

As the long-run growth rate of an economy is influenced by capital accumulation, a country, in order to have high rates of GDP growth, needs to spend significant resources channeled to savings. Moreover, for traditional models, the level of AD is not important, and in the long run, fiscal and monetary policies are not able to influence the product. For that type of models, policies favoring technical progress and structural reforms designed to make prices and wages more flexible, will cause an increase the potential growth of the economy and increase job creation.

For this reason, according to Lavoie & Stockhammer (2013), governments have adopted economic policies, which are defined as pro-capital. These policies are intended to make the labor market more flexible, and some examples may be:

[18]When the labor market reform occurred in Portugal during the TROIKA period, the minimum wage was frozen, the retirement age increased and it was difficult the access to social benefits, such as unemployment benefit (ILO, 2013).

- decreasing the minimum wage;
- weakening labor legislation, collective bargaining, and union power.

Other examples are the reduction of taxes on companies and limiting the taxes on capital gains in the stock market.

For neoclassical economists, wages only constitute a cost to firms. The increase in real wages, in addition to having negative effects on economic growth, leads to increasing unemployment. The reasons pointed out are the existence of increasing marginal costs and the companies' need to maximize profits.

Institutions such as the IMF or the EC have prescribed wage moderation as a means of increasing the potential for economic growth in most countries[19]. As previously mentioned, wage moderation, contributing to wage increases below productivity growth, leads to a decrease in WS.

Although there was a cumulative decrease of 10 percentage points in the WS between 1970s and the pre-crisis period in the OECD countries, the implementation of these economic policies did not lead to higher rates of economic growth - see table 11 in appendix.

By contrast, the PK do not agree that wage moderation stimulates the growth of economies because they argue that wages are a source of additional demand for the economy and that marginal costs of firms are constant, which leads to a decrease in average costs until the level of total productive capacity (Lavoie, 2009). This assumption, which is visible in most economies, [20] will imply that firms have no supply constraints, ie they can increase production to cope with sudden surges in demand. The main limiting factor for the investment is the lack of AD, and this does not depend on saving's level. For this reason, investment decisions will influence economic growth and the functional distribution of income.

The PK consider that the flexibilization of prices and salaries are harmful to an economy. The argument is that, in a situation of recession, the decrease in prices and wages causes a decrease in purchasing power of economic agents, motivated by the increase of the amount of debt in real terms.

For Kalecki (1939), the level of market power of companies is a determining factor of the functional distribution of income. These companies could set a mark-up well above the variable average costs, which made it possible to cover production costs and thus have abnormal profits.

According to PK economists, the marginal propensity to consume through wages is higher than the marginal propensity to consume through profits[21].

Goodwin (Feinstein & Dobb,1967) developed a model that related the Phillips curve to the Kaleckian theory of classes. According to the assumptions of this model, an increase in employment contributes to higher wage growth, which would lead to an increase in WS. Thus, the reduction of business investment will occur in the future and that will culminate in the reduction of the GDP. This model works as a cycle, because in this situation, the reduction of the product will lead to the reduction of employment, which will cause the reduction of the WS.

[19] According to EC (2012), the structural reforms prescript in TROIKA package would contribute to reducing unemployment, regaining global competitiveness and strengthening economic growth, namely the growth of potential output.

[20] See Figure 17 in the appendix.

[21] In the initial Kaleckian models it was assumed that the marginal propensity to consume through wages was 1 and the marginal propensity to consume through profits ranged from 0 to 1.

Likewise, according to Rezai & Carvalho (2015), an increase in the inequality of labor income would contribute to an increase in the marginal propensity of saving by the workers. Thus the transfer of income from the capital factor to labor factor, or from a rich individual to a poor individual, would contribute to an increase in AD[22]. Through these assumptions, the PK defined two regimes: wage-led regime, when the increase of WS contributes to an acceleration of economic growth, and profit-led regime (also known as stagnationists), when the increase of WS contributes to the deceleration of economic growth (Lavoie & Stockhammer, 2012). Thus the adoption of pro-capital policies will favor the economic growth of a country in the profit-led regime, but will hurt economic growth in a wage-led regime. By contrast, the adoption of pro-labor policies will favor economic growth in a wage-led regime, but penalize economic growth in a profit-led regime. The adoption of economic policies contrary to the current economic regime will cause economic instability.

Regarding the impact of WS variation on private investment, there are opposite effects. The increase in WS will provide the increase in AD (due to the higher marginal propensity to consume), which has a positive impact on the level of utilization of productive capacity, that leads to the increase in private investment[23].

However, it also contributes to the increase of the production costs of the companies. By decreasing the PS expected for a given level of productive capacity used at a normal level (profitability effect), there is a stimulus for reducing private investment.

In situations where the accelerating effect is greater than the profitability effect, private investment will not decrease and economic growth accelerates, not only in the immediate but also in the long term, as a result of the acceleration of the rate of capital growth. Thus, the economy lies in a wage led regime, in relation to demand and in relation to investment. By contrast, when the profitability effect is more intense than the accelerating effect, the economy is in a wage led regime in relation to demand, but it is profit led in relation to investment. Thus, long-term growth will slow down because of lower capital accumulation. Finally, when an increase in the WS leads to a decline in private investment that is stronger than the increase in private consumption, economic growth will slow not only in the long run but also at the in the short run.

It is more likely that an economy is on a wage-led regime in the following situations:

1. There is a huge difference between the marginal propensity to consume through wages and profits;
2. Investment is heavily influenced by demand variation and is not sensitive to declining profitability.

Until now, we have considered a closed economy. With the increase in foreign trade, NX were incorporated into the original model (Bhaduri & Marglin, 1990).

We find that an economy can find itself in different regimes, depending whether we are to analyze the economy as closed, or considering the existing trade with the outside. This happens because the increase in WS can lead to the following situations:

[22]These mechanisms are self-reinforcing because wage earners have, on average, a lower level of income than capital holders.

[23]According to the accelerator mechanism, in order to increase private investment is necessary an acceleration of economic growth.

1. a reduction in the margin of companies, which means that some exporters will no longer be economically viable;
2. an increase in the export price, which means that some exported products will no longer be competitive.

When the increase in WS causes an acceleration of economic growth with a closed economy but slowing economic growth with an open economy, the country is in a wage led domestic demand regime and in a profit led total demand regime.

It is more likely that a country will find itself in a wage led scheme when:

1. the degree of openness of the economy is reduced;
2. the elasticity of exports and imports is low.

Despite the analysis of this Kaleckian model, focusing on the effects under AD, the WS variation can also influence supply and productivity evolution. However, this effect will not be analyzed[24].

Some economies in a wage led regime may show high levels of economic growth, despite the use of pro-capital economic measures. However, there must be external mechanisms such as debt-based growth or increased exports. In the first case, there is a need for a continuous increase in the level of indebtedness of economic agents. In the second case, the accumulation of lasting and growing external surpluses is necessary. It is not possible for all countries to present external surpluses at the same time.

If countries seek to pursue policies of price/wage reductions, they will not be able to increase their external market shares and will only contribute to the stagnation of the AD (Beggar thy neighbour policy).

Oliveira (2013), estimated that for Portugal, an increase in 1 p.p in the WS would lead to a deterioration of NX by 0.295%. For this reason, for an individual country, the use of this strategy is limited.

5 Econometric Analysis

Most of the studies that analyze the impact of variations of the WS on economic activity are based on the work of Bhaduri & Marglin (1990). These papers about wage-led growth develop econometric models constructed in single equation. Although it is a simpler methodology to use and the analysis

[24] According to Naastepad & Storm (2013), the increase in wages increases the incentive of companies to invest in more capital-intensive production techniques, to save labor use (productivity effect), and secondly, Kaldor -Verdoon effect (product enhancement has positive effects on better division of labor and increased learning-by-doing - economies of scale).

of the results of the model is more noticeable, it does not allow a complete analysis because it does not allow the interaction between the macroeconomic variables in a dynamic way.

According to the OECD (2012), despite the reduction of the WS since the 1970s, the weight of top income has increased significantly in most countries in the same period[25]. Thus, it is legitimate to say that the reduction of a "standard worker's" WS has been even more intense than discussed at this point.

To capture this effect, beside using the functional distribution of income and following the studies of Rezai & Carvalho (2015) and Palley (2014), I will also include indicators related to the interpersonal distribution of incomes, namely, the weight of top incomes.

To study the impact of variations in income distribution on economic growth in different phases of the economic cycle (Feinstein & Dobb, 1967), it will be included a variable that relates the deviations between effective and potential product.

Following the example of Lavoie & Stockhammer (2012), it will also included a variable related to the external competitiveness of the economy. The chosen variable will be the terms of trade of the economy. Marin (1992) proved that the terms of trade influence the productivity and GDP growth. For Vieira & Holland (2006), the structure of specialization of the imports and exports of a country have impact on the terms of trade of a country .

According to Blecker (2016), AD tends to be more profit led in the short term, and more wage led in the long term, because the positive effects of a higher level of profits on private investment and NX (due to lower wage costs) are stronger in the short run, and the effect of a larger share of private consumption is more intense in the long run.

In this model, it will be studied the interaction between the variables from a long-term perspective.

5.1 Data Description

The data consists of annual time series covering the period between 1985 and 2016. The variables included in the model are as follows: Gross Domestic Product (GDP), Profit Share at factor costs (π), 0,01% Income Share ($TOP001\%$), Terms of Trade ($Ttrade$) and gap between effective and potential unemployment (GAP).

To construct the GDP variable, it is necessary to purge the consumer price index (CPI) to nominal gross domestic product. These two variables are available in the Annual Macro-Economic Database of the European Commission's Directorate General for Economic and Financial Affairs (AMECO).

To construct the variable π it was necessary to calculate the weight of income share (AWS at factor costs). π will be the difference between the total income and the AWS. This variable was also taken from the AMECO database.

The variable $Ttrade$ translates the relationship between the ratio of the export and import prices. All these variables are available in the AMECO database.

Lastly, to construct the GAP variable, it is necessary to withdraw the variables effective unemployment and non acceleration rate of unemployment (NAIRU) from the AMECO database and calculate the difference between the two variables.

[25] For Saez & Veall (2005) the explanation was the large increase in the salaries of top managers.

All variables except GAP are in logarithms.

So far, when the evolution of top income in Portugal has been analyzed, I used the data from Alvaredo (2009) and Guilera (2008). However, because we have the interest of analyzing the evolution of top income in the period after the 2007 Financial Crisis[26], I decided not to use the previous series.

Another reason for not using the previous data was due to data breaks between 1981 and 1989. As in this case the number of observations would be very small, it would not be possible to insert a large set of explanatory variables in the model.

Thus, the variable TOP0,01% was taken from the micro data of QP. This database includes information on employees (I only used full-time employees with full compensation). The variable selected to study these indicators of wage inequality was the monthly gain [27].

The biggest disadvantage of using this data is that it does not include civil servants nor the self-employed.

The objective of this work is to analyze not only the impact of variations in the functional distribution, but also variations in the weight of the various top yields in the long term economic growth.

I constructed 3 econometric regressions.

5.2 Metodological Approach

In order to decide the methodology to be used, it is necessary to determine the order of integration of the variables of the model. For this reason, it is necessary to use the Augmented-Dickey-Fuller (Dickey & Fuller, 1979) test. If there are variables of order two, they must be excluded from the model.

According to the following table, we conclude that the variables of the model do not have the same integration level, ie, there are I(0) and I(1) variables. To overcome this restriction, I consider that the methodology that should be used is Autoregressive Distributed Lag (ARDL).

Table 1: Unit Root Test - ADF Test

	Levels			**1st differences**			**Conclusion**
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None	
π	-0.371	-1.160	0.955	-3.367 **	-5.386***	-5.138***	I(1)
GDP	-2.788*	-1.536	1.142	-	-	-	I(0)
$TOP001\%$	-0.068	-3.611 **	2.082	-	-	-	I(0)
GAP	-1.912	0.186	-1.418	-5.299***	-5.284***	-5.427***	I(1)
$Ttrade$	-4.394***	-5.355***	2.073	-	-	-	I(0)

*, ** and *** mean significance 10%, 5% and 1% level. Number of lags chosen by Akaike Information Criteria (AIC)

[26] Last year where data are available were 2006.

[27] This corresponds to the amount received by the workers in October of each year, gross of taxes and contributions to Social Security.

5.2.1 ARDL Approach

Although the ARDL methodology has been used in econometrics for decades, the use of this method became more frequent, after demonstrating the importance of testing long-term economic relationships when the time series are cointegrated (Pesaran & Shin, 1998).

It is said that the variables are cointegrated if the two series are not stationary, but the linear combination of the series becomes stationary.

In a situation where the two series are not stationary but their linear combination is still non-stationary, the relationship is said to be spurious. Although the regression has a very high R^2, the value of the Durbin-Watson statistic is very low, and the regressions are no longer statistically valid.

Thus, the ARDL is a regressive model, in which the dependent variable, Y_t can be explained by its own lags, and in which it can also be explained by the explanatory variables, both contemporaneously and by their past effects.

The ARDL model has the following general form:

$$Y_t = \delta_0 + \sum_{i=1}^{p} \beta_i y_{t-i} \sum_{m=0}^{k} \sum_{c=0}^{q} \beta_c x_{m,c-i} + \epsilon_t \tag{5}$$

where δ is a constant, y_t is a dependent variable, x_t is a vector of independent variables and ε_t is a white noise error term.

ARDLs is usually defined with the following notation: ARDL(p, q1, qk), where p is the number of lags of the dependent variable, q1 is the number of lags of the first explanatory variable, qk and is the number of lags of the k-th explanatory variable.

Next, we will proceed to choose the optimal ARDL model.

As previously mentioned, the following regressions will be constructed:

$$Regression1 : GDP_t = \delta_0 + \sum_{i=1}^{p} \phi_1 GDP_{t-i} + \sum_{i=0}^{p} \phi_2 \pi_{t-i} + \sum_{i=0}^{p} \phi_3 TOP001\%_{t-i} \tag{6}$$

$$Regression2 : GDP_t = \delta_0 + \sum_{i=1}^{p} \phi_1 GDP_{t-i} + \sum_{i=0}^{p} \phi_2 \pi_{t-i} + \sum_{i=0}^{p} \phi_3 TOP001\%_{t-i} + \sum_{i=0}^{p} \phi_4 GAP_{t-i} \tag{7}$$

$$Regression3 : GDP_t = \delta_0 + \sum_{i=1}^{p} \phi_1 GDP_{t-i} + \sum_{i=0}^{p} \phi_2 \pi_{t-i} + \sum_{i=0}^{p} \phi_3 TOP001\%_{t-i} + \sum_{i=0}^{p} \phi_4 Ttrade_{t-i} \tag{8}$$

5.2.2 ARDL Order Selection Model

Next we will decide the number of optimal lags that our model should present.

To choose the optimal length model, we used the Akaike Information Criteria (AIC) (Akaike,1974).

With this test, we are comparing the different possible models from the relative point of view, and the model to be chosen is the one with the lowest criterion value.

The AIC attaches importance to goodness of fit, but also includes disincentives for the model not to

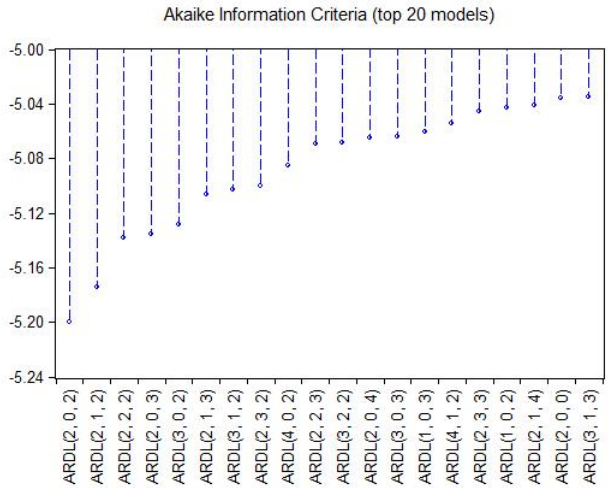
have too many estimated parameters. This, since it increases the number of parameters of the model, will necessarily imply an increase of the goodness of the fit.

In addition, it can be use one of the criteria : the information criterion (BIC) or information criterion of HannanQuinn (HQC).

Although, according to Burnham et al. (2004) and Yang (2005), the use of the first criterion of information is more correct. This happens because the AIC is asymptotically optimum when selecting the least residual model, with the assumption that "true model" is never chosen.

The following figures summarize the values resulting from the AIC criteria to the top 20 models of the selection:

Figure 8: Model 1 selection



Thus, the ARDL model chosen through the AIC criterion is as follows:

$$GDP_t = \delta_0 + \phi_1 GDP_{t-1} + \phi_2 GDP_{t-2} + \beta_1 \pi_t + \gamma_1 TOP001\%_t + \gamma_2 TOP001\%_{t-1} + \gamma_3 TOP001\%_{t-2} + \varepsilon_t \quad (9)$$

where δ_0 represents the constant and ε_t represents the white noise error term.

For regressions 2 and 3, the models chosen through the AIC[28] criteria are as follows:

$$GDP_t = \delta_0 + \phi_1 GDP_{t-1} + \phi_2 GDP_{t-2} + \phi_3 GDP_{t-3} + \phi_4 GDP_{t-4} + \beta_1 \pi_t + \beta_2 \pi_{t-1} + \beta_3 \pi_{t-2} + \beta_4 \pi_{t-3} + \beta_4 \pi_{t-4} + \gamma_1 TOP001\%_t + \theta_1 GAP_t + \theta_2 GAP_{t-1} + \varepsilon_t \quad (10)$$

[28] Top graph of 20 models according to the AIC criteria are available in the appendix.

$$GDP_t = \delta_0 + \phi_1 GDP_{t-1} + \phi_2 GDP_{t-2} + \beta_1 \pi_t + \beta_2 \pi_{t-1} + \beta_3 \pi_{t-2} + \beta_4 \pi_{t-3} + \gamma_1 TOP001\%_t + \gamma_2 TOP001\%_{t-1} + \gamma_3 TOP001\%_{t-2} + \alpha_1 Ttrade_t + \alpha_2 Ttrade_{t-1} + \varepsilon_t \quad (11)$$

5.2.3 Hypotheses to be tested

After choosing the optimal lag length, it is necessary to perform a set of statistical tests to analyze if it can be used.

Firstly, it is necessary to analyze if the model presents autocorrelation in the residues. If this does not happen, the estimator is no longer efficient, that is, its variance is no longer minimal. If the null hypothesis is the absence of autocorrelation, applying the Breusch-Pagan-Godfrey Serial Correlation LM Test, we prove that there is no evidence of serial correlation.

The summary of test results can be found in the table below:

Table 2: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.764078	Prob. F(2,21)	0.4783
Obs*R-squared	2.034994	Prob. Chi-Square(2)	0.3615

It is also necessary to determine if the variance of the estimated errors is constant, ie, if the model has heteroscedasticity. Therefore, it is necessary to test again by applying the Breusch-Pagan-Godfrey.

The null hypothesis assumes that the residues are homoscedastic. Thus, according to the following table, we cannot reject that the model is homoscedastic.

Table 3: Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.827900	Prob. F(6,23)	0.5604
Obs*R-squared	5.328416	Prob. Chi-Square(6)	0.5024
Scaled explained SS	2.523662	Prob. Chi-Square(6)	0.8658

Next we will study if the model is well specified. That is, if the model is in an incorrect functional form, or lastly, if the number of lags in the model is not correct. To study the functional specification of the model we will use the RESET test. According to the value of F-Statistic, we cannot reject in any of the series, the null hypothesis, which indicates that the various regressions are not badly specified.

Table 4: RESET Test

	Value	df	Probability
F-statistic	0.398781	(2, 21)	0.6761

Next, we will analyze whether the regression residuals follow a normal distribution. According to Jarque & Bera (1980), if the residuals are "well distributed" the distribution will be normal. As in this case, the Jarque-Bera test statistic has a reduced value, we do not reject the null hypothesis of well-distributed residues.

Table 5: Jarque Bera Test

Statistic		
$nR_u^2 \rightarrow^d \chi^2_{(30)}$		0,466576
		(0,791925)
χ_2- statistics are reported ρ - value between parenthesis		

Finally, it is necessary to analyze, if the model is stable. Thus, the most important tests to analyze stability are the CUSUM and the CUSUMSQ test based on the cumulative sum of the recursive residuals and on the cumulative sum of squares of the recursive residuals (Brown et al., 1975). If the model is not stable there will be structural breaks, that is, an unexpected shift in the time series, which can lead to predictive errors and model unreliability.

CUSUM is most commonly used to track changes to detect recurring changes in regression coefficients. On the other hand, the CUSUMSQ, is used to ascertain a situation where the departure of the constancy of the regression coefficients is casual and sudden.

When a model is stable, CUSUM and CUSUMSQ will be approximately zero. This option presents a critical line of 5%. If the test statistic is outside the area between the critical lines the model will suffer from instability.

Figure 9: CUSUM Test

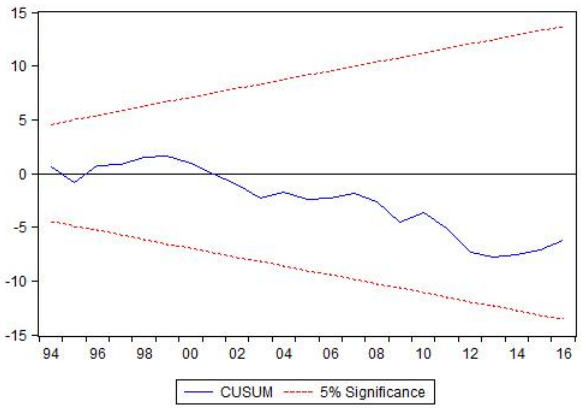
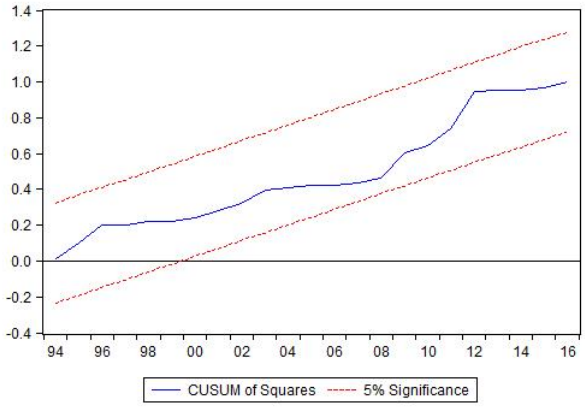


Figure 10: CUSUMQ Test



As can be seen, CUSUM and CUSUMSQ remain within the boundary throughout the time series period, which means that the model is stable.

After the model has passed the tests required for its use, it is now possible to analyze the long-term relationship between the variables, through the bounds test approach to cointegration[29].

5.2.4 Bounds Tests

According to Pesaran & Smith (2001), to apply the Bounds test to the cointegration, it is necessary to calculate the model to the differences ($GDP_t - GDP_{t-1}$) and to introduce on the right side of the expression, the various coefficients of the explanatory variables of the model, in order to estimate a conditional error correction mechanism (ECM).

To analyze if there is no long-term relationship between the variables, it is necessary to perform an F-Test, estimating the null hypothesis,$H0$:$\phi_{1=}\phi_2 = \phi_3 = 0$. If we reject the null hypothesis, it means that the long-term coefficient of the variables is different from 0, and there is a relationship between them.

$$\triangle GDP = \delta_0 + \phi_1 GDP_{t-1} + \phi_2 \pi_{t-1} + \phi_3 TOP001\%_{t-1} + \alpha_1 \triangle GDP_{t-1} + \omega_1 \triangle TOP001\%_t + \omega_2 \triangle TOP001\%_{t-1} + \varepsilon_t \quad (12)$$

When conducting a joint significance test of the previous regression there may be several problems. The distribution will be different depending on whether the regression is I (0) or I (1). However, to address this situation, Pesaran & Smith (2001) provide bounds on the critical values for the asymptotic distribution of the F-statistic.

Thus, a lower and upper limit is set for the value of the critical values. If the F-statistic exceeds the lower limit, it means that all explanatory variables of the model are stationary, ie I (0), and

[29] All statistical tests were performed for the remaining regressions and are found in the appendix.

cointegration cannot be used. If the F statistic exceeds the upper limit, it means instead that all the explanatory variables of the model are I (1), and cointegration can be used.

The lower bound is based on the hypothesis that all the variables are I(0), and the upper bound means that all of the variables are I(1). Lastly, if the statistical test is between the two intervals, the test is not conclusive.

Table 6: Bounds Test

Test Statistic	Value	k
F-statistic	6.922872	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

When analyzing the value of the test statistic, we did not reject the null hypothesis of non-cointegration at 1%. Thus, we can estimate the model that illustrates the long-term relationships between variables.

5.2.5 Long Run Model

The long-term model can be derived from the conditional ECM. The following is presented in the static form:

$$GDP_t = \Omega_0 + \Omega_1 \pi_t + \Omega_2 TOP001\%_t + \varepsilon_t \tag{13}$$

where Ω_n is the long-run coefficient of the model variables.

The table represents the coefficient and level of significance of the variables of the three regressions:

Table 7: Long-Run Coefficients - Regression 1

	Variables	Coefficient	P-Value
Ω_1	π	-0.469758**	0.0362
Ω_2	$TOP001\%$	0.285974***	0.0000

Table 8: Long-Run Coefficients - Regression 2

	Variables	Coefficient	P-Value
Ω_1	π	-0.430000***	0.0011
Ω_2	$TOP001\%$	0.24314***	0.0000
Ω_3	GAP	-0.028459**	0.0399

Table 9: Long-Run Coefficients - Regression 3

	Variables	Coefficient	P-Value
Ω_1	π	-0.458778*	0.0737
Ω_2	$TOP001\%$	-0.061989	0.7138
Ω_3	$Ttrade$	2.661807**	0.0362

5.3 Discussion of Results

In the long term, except for variable $TOP001\%$ [30], all variables are statistically significant. Contrary to the initial expectations, the results indicate that an increase in $TOP001\%$ contributes to an acceleration of the GDP growth rate.

In the case of regression 1, a 1.p.p increase in $TOP001\%$ will contribute to the acceleration of GDP growth of 0.29 p.p in the long run. One possible explanation for the positive effects of the rise in top-level inequality is the possibility to differentiate rewards and provide incentives for economic agents to work longer hours, invest and innovate (Krueger, 2018).

The variable π shows the expected coefficient signal. For the same regression, a 1.p.p increase in π causes a long run deceleration of GDP growth of about 0.46 p.p.

The GAP variable has an expected impact, but the value of its coefficient is very low. In the regression 2, a 1.p.p increase in GAP causes a residual long run deceleration of GDP growth of about -0.03 p.p. One possible explanation for the absence of economic impacts is the consideration of the neutrality of the money in the long run, that is, discretionary policies have no long-term impact (Lucas, 1972).

Regarding the importance of foreign trade, the variable $Ttrade$ shows the the expected coefficient signal. Thus, in the regression 3, the improvement of 1.p.p in the $Ttrade$ contributes to the long run acceleration of the GDP growth of about 2,66 p.p. The justification for this is that changes in terms of trade influence the rate of sustainable economic growth that mantains the balance of payments in equilibrium (McCombie & Thirlwall, 1994).

[30] In regression 3.

In short, the results indicate that the Portuguese economy is in a wage led regime in relation to the functional distribution of income, but presents characteristics of profit led regime with respect to the interpersonal distribution of income.

This results confirm the research developed by Palley (2013). The functional distribution of incomes (according to factors of production) does not fully reflect totally social power balances. In fact, many income qualified as "work" are in fact "agency" (salaries of administrators, managers).

The transfer of income from the capitalists to blue collar workers causes the economy to accelerate. Meanwhile, the transfer of income from white collar workers to blue collar workers, causes the slowdown of the economy.

6 Conclusions

The objective of this work was to analyze the impact of the (functional and interpersonal) income inequality for the Portuguese economy in the long term for the period between 1985-2016. At the beginning of the study, we analyzed the evolution of the Portuguese economy on a long-term trend since 1960, and it was concluded that there was a downward trend in GDP growth rate.

Regarding the functional distribution of income, the weight of profits in total income has tended to increase since the late 1970s. Regarding the weight of top income, although it has not yet reached the high levels of the 1960s, the trend has also been growing.

It was expected that, the decline in the WS in total income and the increase in interpersonal inequality in Portugal, would cause the deceleration of GDP.

According to the PK theory, the reduction in WS, and at the same time, the increase of interpersonal inequality, would contribute to a reduction of the AD, because the marginal propensity to consume through wages is higher than the marginal propensity through interest, income or profits. Just as the marginal propensity to consume by low-income agents is higher than the marginal propensity of high-income individuals.

The results of the models indicate that the transfer of earnings from the labor factor to the capital factor will have the effect of slowing the economic growth in the long run. Contrary to expectations, the increase in the weight of top income in Portugal has not led to a slowdown in economic growth from a long-term perspective. As expected, improved terms of trade have positive effects on economic growth.

The performance of this study presented problems, since the number of observations regarding data of interpersonal income inequality was insufficient and with breaks.To solve this problem it was necessary to work the data of the Gabinete de Estratégia e Planeamento - MTSS. However, as the number of observations continued to be reduced (32), it was not possible to include more explanatory variables or to analyze the impact of changes in functional and interpersonal income inequality in different periods of the Portuguese economy (for the period before entering the EU, ie 1960-1985, and the following period, 1986-2016).

Despite the problems with the data, this work has the merit of being one of the few studies on the Portuguese economy, where income inequality is analyzed and related to economic growth, in a long term perspective.

As the reasons for the increase in the weight of PS are essentially the same as the increase in top income, it can be concluded that governments should be focused on increasing WS, because the positive effect of the increase in this indicator is stronger than the long-term reduction of GDP caused by the decrease in top inequality (in regression 1 is 0.46 vs -0,28).

Given the high level of external debt in Portugal, the adoption of this economic policy strategy is not easy for an individual country. Thus, in order to avoid external imbalances, there must be cooperation among countries to raise WS.

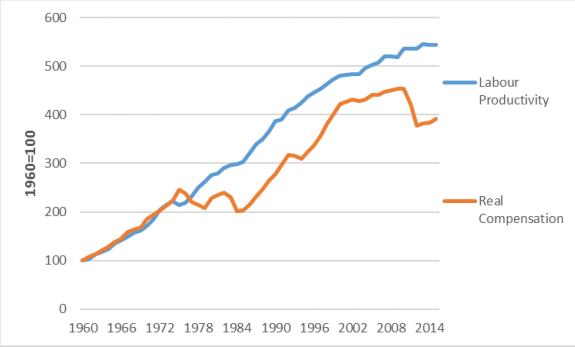
A Appendix

Table 10: Evolution of adjusted wage share (AWS) at GDP market prices in countries most affected by the sovereign debt crisis

	2009	2010	2011	2012	2013	2014	2015	2016	ΔAWS
Ireland	52,9	49,7	47,9	47,3	47,9	46,3	36,9	37,5	-15,5pp
Greece	54,1	54,3	53,1	52,2	49,8	49,5	48,9	49,9	-4,2pp
Spain	58,7	57,7	57,1	55,6	55,1	55,1	54,9	54,5	-4,2pp
Italy	54,2	54,1	53,6	53,7	53,4	53,0	53,0	53,1	-1,1pp
Cyprus	55,8	54,6	54,5	54,3	51,9	50,6	50,5	51,1	-4,7pp
Portugal	57,6	56,5	55,5	54,0	53,7	52,7	51,3	51,4	-6,2pp

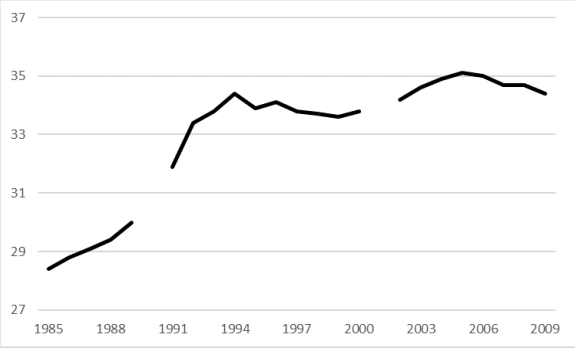
Source = AMECO

Figure 11: Evolution of real compensation and labour productivity in Portugal



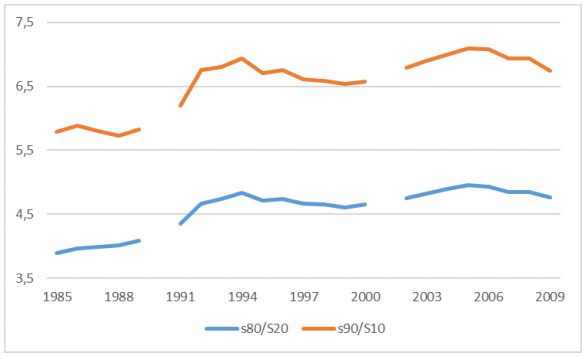
Source = Ameco; Data developed by my own.

Figure 12: Gini index



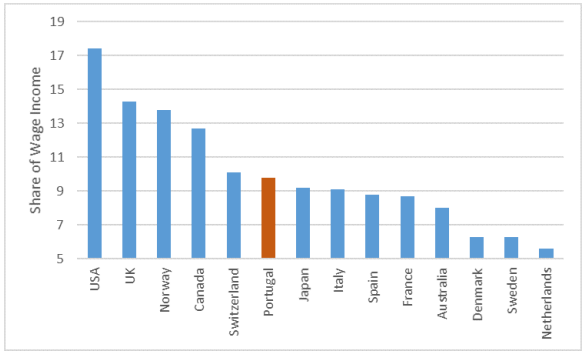
Source = QP (1985-2009)

Figure 13: S80/S20 and S90/S10



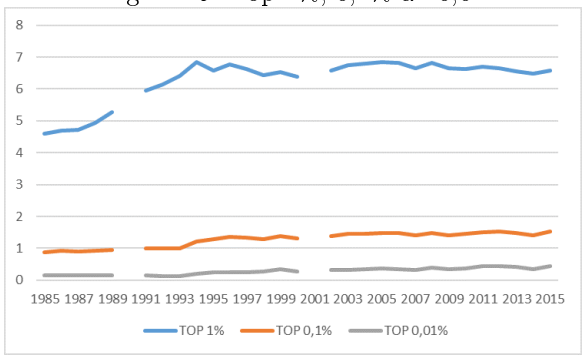
Source : QP (1985-2009)

Figure 14: Share of the average annual income of the richest 1% in OECD countries (2005)



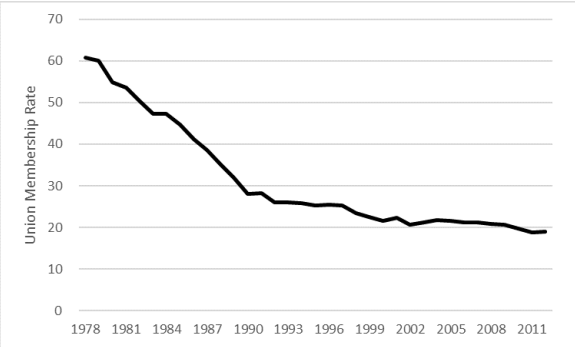
Source:Alvaredo, F., Atkinson A., Piketty T. & Saez E., The World Top Incomes Database, http://topincomes.g-mond.parisschoolofeconomics.eu.

Figure 15: Top 1%, 0,1% an 0,01



Source : QP

Figure 16: Union Rate Density



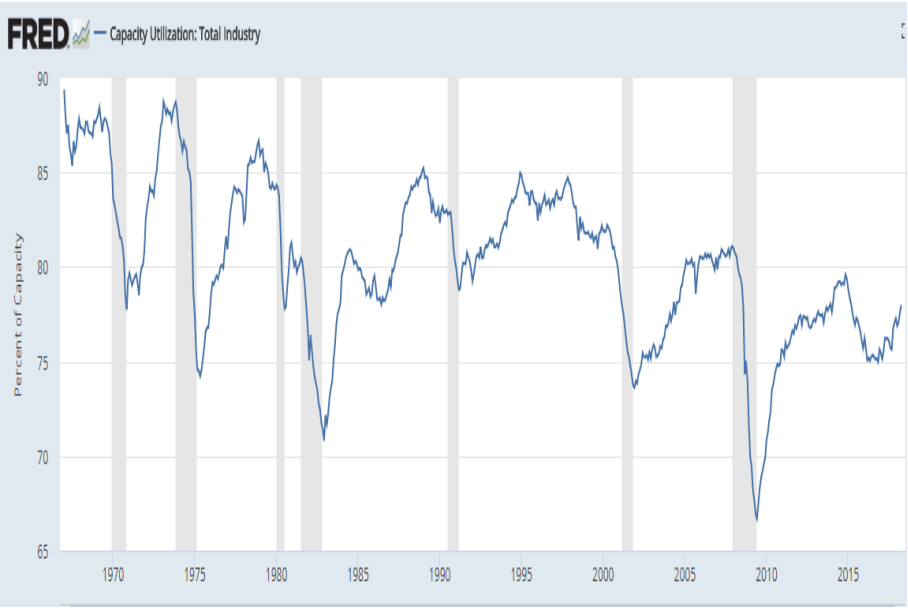
Source: OECD

Table 11: GDP growth rate in developped countries

	Euro area-12	Germany	France	Italy	United Kingdom	United States	Japan	Canada	Australia
1961–69	5.30	4.39	5.71	5.77	2.90	4.69	10.14	5.37	5.53
1970–79	3.78	3.27	4.15	4.02	2.42	3.32	5.21	4.11	3.07
1980–89	2.27	1.96	2.31	2.55	2.48	3.04	4.37	3.04	3.35
1990–99	2.15	2.32	1.86	1.43	2.24	3.21	1.46	2.44	3.32
2000–07	2.13	1.53	2.10	1.46	2.73	2.61	1.73	2.92	3.31

Source: Onaran and Galanis (2012)

Figure 17: Capacity Utilization Total Industry - United States of America



Source: FRED

Figure 18: Model 2 selection

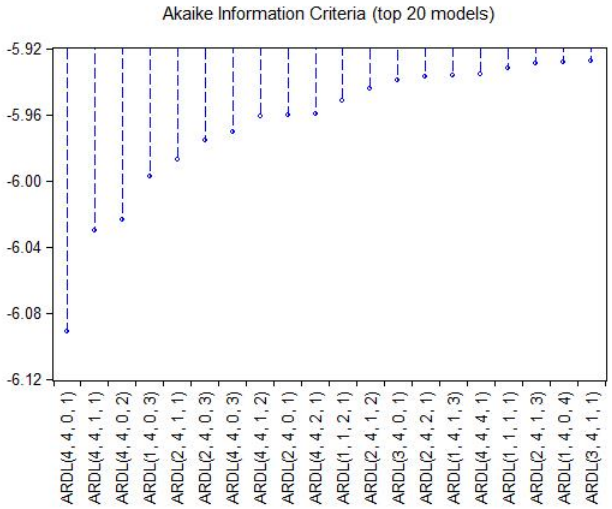


Figure 19: Model 3 selection

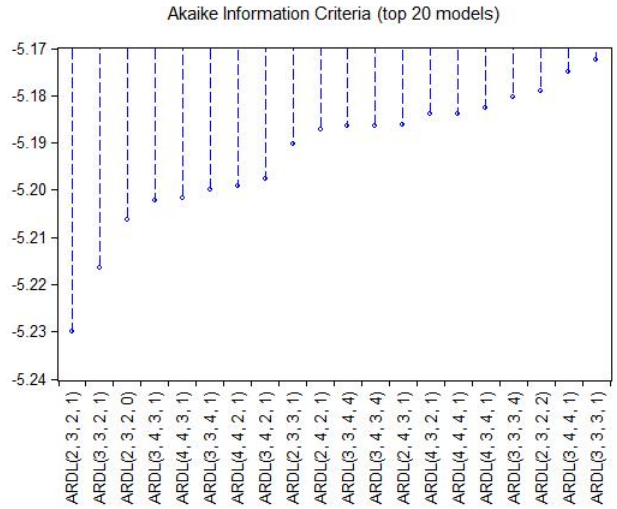


Table 12: Breusch-Godfrey Serial Correlation LM Test - Regression 2

F-statistic	0.625636	Prob. F(2,13)	0.5503
Obs*R-squared	2.458420	Prob. Chi-Square(2)	0.2925

Table 13: Breusch-Godfrey Serial Correlation LM Test - Regression 3

F-statistic	1.558632	Prob. F(2,15)	0.2427
Obs*R-squared	4.989752	Prob. Chi-Square(2)	0.0825

Table 14: Heteroscedasticity Test: Breusch-Pagan-Godfrey - Regression 2

F-statistic	0.933468	Prob. F(12,15)	0.5409
Obs*R-squared	11.97045	Prob. Chi-Square(12)	0.4481
Scaled explained SS	2.212026	Prob. Chi-Square(12)	0.9990

Table 15: Heteroscedasticity Test: Breusch-Pagan-Godfrey - Regression 3

F-statistic	1.841055	Prob. F(11,17)	0.1250
Obs*R-squared	15.76567	Prob. Chi-Square(11)	0.1501
Scaled explained SS	4.103046	Prob. Chi-Square(11)	0.9668

Table 16: RESET Test - Regression 2

	Value	df	Probability
F-statistic	0.432164	(2, 13)	0.6581

Table 17: RESET Test - Regression 3

	Value	df	Probability
F-statistic	0.758573	(2, 15)	0.4855

Table 18: Jarque Bera Test - Regression 2

Statistic	
$nR_u^2 \rightarrow^d \chi^2_{(28)}$	0,595271
	(0,742572)
χ_2- statistics are reported ρ - value between parenthesis	

Table 19: Jarque Bera Test - Regression 3

Statistic	
$nR_u^2 \rightarrow^d \chi^2_{(29)}$	0,284821
	(0,867275)
χ_2- statistics are reported ρ - value between parenthesis	

Figure 20: CUSUM Test - Model 2

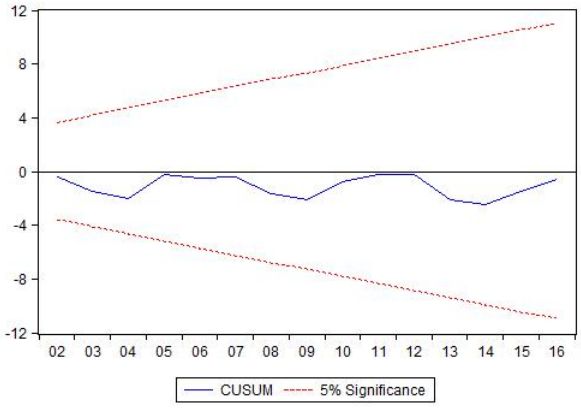


Figure 21: CUSUM Test - Model 3

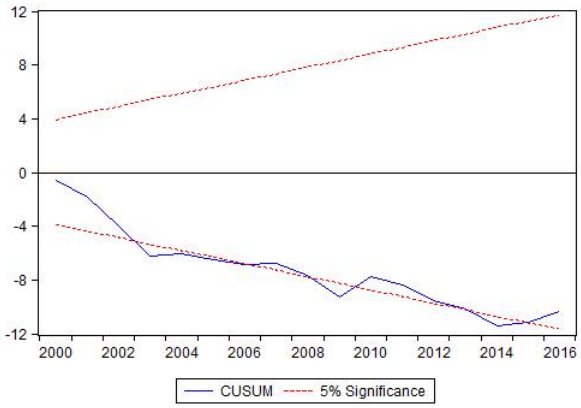


Figure 22: CUSUMQ Test - Model 2

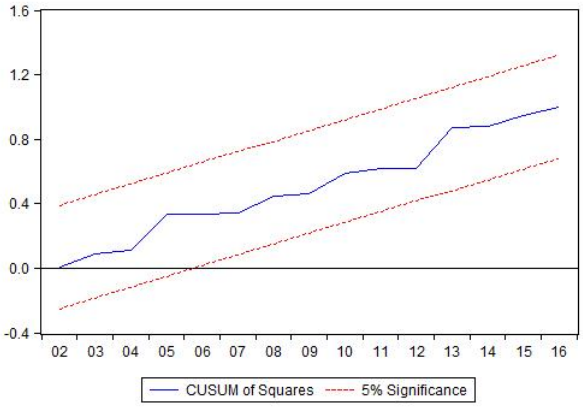


Figure 23: CUSUMQ Test - Model 3

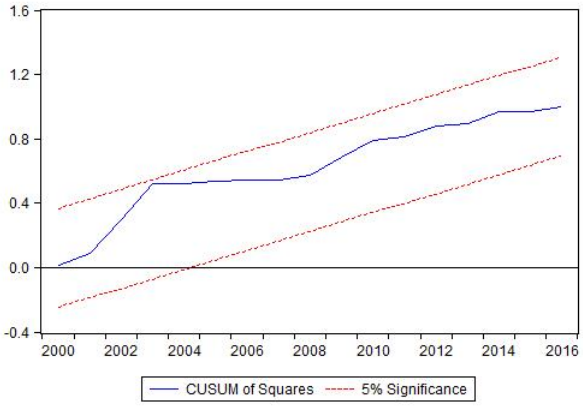


Table 20: Bounds Test - Regression 2

Test Statistic	Value	k
F-statistic	5.948717	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table 21: Bounds Test - Regression 3

Test Statistic	Value	k
F-statistic	6.036206	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Table 22: Data Sources

Mathematical Symbol	Series name	Source
GDP	Gross Domestic Product	AMECO
π	Adjusted Profit Share	AMECO
GAP	Gap between effective and potential unemployment	AMECO
$TOP001\%$	Top 0,01% income share	Quadros de Pessoal
$Ttrade$	Terms of Trade	AMECO

Table 23: Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	St. Dev.	Observations
GDP	151,95	167,37	181,99	92,40	27,64	32
π	0,35	0,35	0,40	0,31	0,02	32
GAP	0,39	0,35	3,03	-1,20	1,04	32
$TOP001\%$	0,29	0,32	0,51	0,13	0,11	30
$Ttrade$	95,87	97,97	105,92	73,19	6,61	32

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